

INSTITUTE FOR DEFENSE ANALYSES

References for Capability Assessment, Acquisition Planning, and Cost Estimation

Wade P. Hinkle, Project Leader Milton L. Tulkoff Rachel D. Dubin

August 2011
Approved for public release;
distribution is unlimited.

IDA Document NS D-4400
Log: H 11-001383



The Institute for Defense Analyses is a non-profit corporation that operates three federally funded research and development centers to provide objective analyses of national security issues, particularly those requiring scientific and technical expertise, and conduct related research on other national challenges.

About this Publication

This work was conducted by the Institute for Defense Analyses (IDA) as an IDA independent research program (C6309). The views, opinions, and findings should not be construed as representing the official position of either the Department of Defense or any IDA sponsoring organization.

Acknowledgements

The authors wish to express their thanks to Ms. Beth Johnson for her superb advice and assistance as the editor, and Ms. Barbara Varvaglione for expertly overseeing all production aspects of this publication. We deeply appreciate the efforts of the IDA library, in particular Ms. Amanda Talcott, in helping us locate many of the references, and the endeavors of Mr. Bob Romic, U.S. Army Corps of Engineers, Technical Library, in helping us gain access to a particularly important reference. Also, special thanks to Mr. Jim Delaney for facilitating our interactions with the Japan Audit Office. The dedicated and knowledgeable efforts of our colleagues, as noted above, contributed significantly to the development of this IDA report. Any errors, inaccuracies, and omissions, are solely the responsibility of the authors.

Copyright Notice

© 2011 Institute for Defense Analyses, 4850 Mark Center Drive, Alexandria, Virginia 22311-1882 • (703) 845-2000.

This material may be reproduced by or for the U.S. Government pursuant to the copyright license under the clause at DFARS 252.227-7013 (NOV 95).

INSTITUTE FOR DEFENSE ANALYSES

IDA Document NS D-4400

References for Capability Assessment, Acquisition Planning, and Cost Estimation

Wade P. Hinkle, Project Leader Milton L. Tulkoff Rachel D. Dubin

Executive Summary

This document is the Institute for Defense Analyses' (IDA) response to a Japanese government request for a list of references treating defense capability assessments, acquisition planning, and cost estimation analyses.

In recent years, IDA researchers and representatives of the Japanese government's Board of Audit have held periodic informal exchanges of views on matters of mutual interest relating to defense acquisition and cost estimating practices. During an April 2011 meeting of IDA representatives and officials of the Japan Defense Audit Office, the Japanese side requested IDA assistance in providing them with references addressing the following topics:

- Methods and processes used by the U.S. Department of Defense (DOD) to determine required capabilities
- Methods and processes for independent cost estimation
- Methods and processes for cost estimation in cost reimbursable contracts

The types of information sources identified and reviewed for this study included, among others, books, journals, periodicals, articles, documents, and websites. In developing the list of references presented in this paper, the IDA study team's objective was to be highly *selective*, i.e., to incorporate the *most pertinent and useful* U.S., and non-U.S. publications and sources. The team did not seek to compile a highly comprehensive or all-inclusive collection of all or most of the literature addressing the topics of interest to the Japan Audit Office.

To enable study users to gain quick access to the references, the document includes a set of "References Access" CDs containing PDF files or links to websites where the publications can be directly downloaded at no cost or information on where the publications can be purchased or obtained from public and other libraries in the geographic vicinity of the user.

IDA welcomes readers' feedback regarding this document. Readers may contact IDA via the addresses shown in Section G.

Contents

1.	Ove	erview, Issues, and Approach	1
	A.	Organization	1
	B.	Background	1
	C.	Issues	2
	D.	Information Sources, Review Approach, and Presentation Sequence	4
	E.	Results Summary	5
	F.	Accessing References Identified in the Study	5
	G.	Readers' Feedback	5
2.	Res	ults of the Collection Effort	7
	A.	Tier I References	7
	B.	Tier II References	10

1. Overview, Issues, and Approach

This document is the Institute for Defense Analyses' (IDA) response to a Japanese government request for a list of references treating defense capability assessments, acquisition planning, and cost estimation analyses. Funding for the research came from IDA's Central Research Program.

A. Organization

This paper is organized into two chapters and includes a set of two compact disks (CDs).

Chapter 1, Overview, Issues, and Approach:

- Explains the objectives and organization of the study
- Addresses background on the overall effort
- Discusses two major issues that arose during the course of the study
- Provides information sources, review methods, and presentation sequence
- Summarizes results
- Provides guidance on how readers can access references identified by this study
- Solicits comments and provides information on how to submit feedback

Chapter 2, Results of the Collection Effort, presents the full list of references identified in the collection effort.

The CD set (attached to the inside cover of the paper copy of this document) provides quick access to references (via PDF files or hyperlinks) or identifies where references can be obtained.

B. Background

In recent years, members of the U.S. Institute for Defense Analyses (IDA) and representatives of the Japanese government's Board of Audit have held periodic informal discussions to exchange views on matters of mutual interest relating to defense acquisition and costing practices. During an April 15, 2011, meeting of IDA representatives and officials of the Japanese Audit Office, and in a follow-up email message from the Japanese Audit Office officials to IDA, the Japanese requested assistance from IDA in providing them with guidebooks or other useful references on the following specific topics:

 The method and the process of making decisions for capabilities and user needs in the U.S. Department of Defense Acquisition Management system

- The method of calculation for independent cost estimation
- The method of calculation for cost estimation in cost reimbursable contracts

C. Issues

The request by the Japanese Audit Office seemed straightforward on the surface. As the IDA study team initiated efforts to address this request, however, two issues presented themselves. The first issue was whether IDA should address the topics solely from the perspective of the approaches used within the U.S. Department of Defense or whether IDA should address it from a broader international perspective. The second issue was how to be of assistance concerning the third topic of interest to the Audit Office (the method of calculation for cost estimation in cost reimbursable contracts) given that the IDA study team was unable to locate any guidebooks or other references addressing that issue from a costing perspective.

First Issue: Should IDA solely provide references addressing U.S. DOD processes or provide a broader range of references including processes used by other nations?

Although the simple text of the Japanese Audit Office request seemed to indicate an interest solely or primarily in U.S. DOD approaches, the IDA study team had doubts whether that approach would be fully helpful to their Japanese colleagues in addressing resource management matters of concern to Japan. The context of the Japanese request for references is that Japan has a high priority requirement to improve its ability to address the defense planning topics listed in the Audit Office request to IDA. The crux of the request, therefore, seemed to be to obtain quality references that could be easily understood by and be helpful to Japan, regardless of the source. IDA thus made the judgment that the source of those references did not appear to be a vital factor, but recognized there was interest regarding U.S. practices.

IDA's view on this issue—influenced by U.S. DOD and IDA's two decades of experience in assisting nations around the world in their defense resource management and analysis efforts—has been that direct transfer of U.S. DOD resource management approaches to other nations is often problematic. U.S. DOD approaches are often quite complex. This complexity is most often not because the basic principles underlying the U.S. DOD processes are complicated. Typically the fundamental underlying principles are quite understandable and logical. Rather, the complexity of the U.S. DOD processes is usually due to the fact that they must address unique characteristics and features of the U.S. planning system (e.g., combatant commands with worldwide responsibilities) that do not apply to most other nations. Also, the DOD capabilities assessment and acquisition planning process has undergone major changes in recent years, and some important components of those processes are still largely interim or aspirational solutions. By the same token, it was IDA's view that even if some U.S. processes were potentially transferable, it would not be advisable to solely provide official U.S. DOD directives and instructions addressing those topics, since those publications were, for the most part, written by

and for insiders and are typically not easily understandable by those who have not worked extensively within the U.S. DOD system.

Thus, IDA's response to the Japanese Audit Office request entails a two-tiered approach.

Tier I contains a listing of the most authoritative, informative, useful, user-friendly, and jargon-free references the study team could locate—regardless of country of origin—that address the topics raised by the Japanese Audit Office from a variety of perspectives, not just a U.S. DOD perspective.

Tier II contains U.S. government legislation and formal U.S. DOD directives and instructions that relate—directly or indirectly— to the topics raised by the Japanese Audit Office.

Within both tiers, IDA has categorized the reference material to reflect the topics raised by the Japanese Audit Office. (For example, within Tier I, the first category, I-A, contains U.S. and non-U.S. references addressing defense capability and acquisition, while Category I-B contains U.S. and non-U.S. references addressing cost assessment and independent cost estimation.)

Second Issue: How to be of assistance concerning the third topic of interest to the Japanese Audit Office--the method of calculation for cost estimation in cost reimbursable contracts-given that IDA was unable to locate any guidebooks or other references addressing that issue from a costing perspective? What other assistance could IDA provide regarding cost reimbursable contract issues?

Cost reimbursable (or reimbursement) contracts involve reimbursing contractors for all reasonable and allowable expenses incurred in fulfilling a contract to the extent permitted by the provisions of the contract. This process entails developing an estimate of total costs that is used to obligate funding and establish a ceiling that the contractor cannot surpass, except at his own peril. Cost reimbursable contracts include, among others, cost plus award fee contracts, cost plus fixed fee contracts, and time and materials contracts. Such contracts are typically used because of high uncertainty due to a rapidly changing situation, high technical and/or organizational complexity, high technical innovation, and other such uncertainty factors.

IDA's search efforts did not identify any references that deal entirely—or even partially in a substantive manner —with cost estimation approaches specifically addressing cost reimbursable contracts. While the results of this search effort prevented IDA from providing the exact type of guidebooks and references requested on this topic, the IDA study team was able to identify alternative approaches that would enable the Japanese Audit Office to glean information that would be useful to it in dealing with issues regarding cost reimbursable contracts. These alternatives are discussed below.

Since a principal characteristic of—and typical source of difficulty in implementing—cost reimbursable contracts is high uncertainty, IDA believes that it would be useful for their Japanese colleagues to carefully review the extensive list of cost estimation references in sections I-B and II-B (of Chapter 2) for discussions that address development of cost estimates

for projects that entail high uncertainty. For example, in the RAND publication, *Cost Considerations in Systems Analysis*, (Tier I item B-3) the subject matter index provides multiple references to discussions on cost estimating under high uncertainty.

Other sources of information that IDA believes would be useful to their Japanese colleagues in identifying approaches for dealing with cost reimbursable contract issues are publications addressing this general topic from a contracting rather than cost estimating point of view, e.g., that provide guidelines and best practices on how to develop and monitor such contracts to minimize problems associated with that form of contracting. In IDA's categorization of Tier I publications, category I-D provides recommended approaches and best practices for structuring and monitoring cost reimbursable contracts.

D. Information Sources, Review Approach, and Presentation Sequence

Types of information sources identified and reviewed for this information search included, among others, books, journals, periodicals, articles, documents and websites. In developing the list of references presented in this paper, the IDA study team's objective was to be highly selective, i.e., to incorporate the most pertinent and useful U.S., and non-U.S publications and sources. The IDA study team was not seeking to compile a highly comprehensive or all-inclusive collection of all or most of the literature addressing the topics of interest to the Japan Audit Office.

IDA's primary criteria for selecting items for Tier I included:

- Extent to which reference effectively addressed some major portion or multiple portions of the topic of interest for this project
- Quality and clarity of the writing
- User-friendliness of the presentation

IDA's selection guidelines also sought to ensure that the collection of material addressed the topic of interest from several perspectives, including references that provided a highly user-friendly and clear overview as well as references that elaborated on the details of the topic overall or discussed major components of it.

Given the short response requirement for this task, the IDA study team did not have time to do an exhaustive search to try to identify with high confidence the best of the best. Rather, the team's approach was to identify references that adequately met the basic criteria within the timeline for completing this task. The IDA study team believes this goal was exceeded for many of the references we identified.

The contents of each major section of Tier I are displayed in a reading sequence that the project team for this task believes will best enable users to review, comprehend, and efficiently use the material that has been collected.

The contents of Tier II generally follow the numbering system of the various types of documents included in that section, thus are not intended to reflect a recommended reading sequence.

E. Results Summary

The IDA search, screening, and review efforts yielded a total of thirty-five references that the study team determined had met the criteria established for the study and believed would be responsive to the Japan Audit Office request. Of this total, 54 percent address capability and acquisition analysis and planning, 40 percent address cost estimation/analysis, and the remaining 6 percent deal with cost reimbursable contracts.

F. Accessing References Identified in the Study

An important consideration in presenting the results (in Chapter 2) of IDA's search effort was to enable users of this study —to the maximum extent possible—to easily gain quick access to those references. For this reason, a set of two "References Access" CDs is provided with each copy of this publication. Those CDs contain (1) PDF files (for most of the references identified), (2) links to websites where the publications can be directly downloaded at no cost (copyright regulations prevented providing PDFs for several publications), and (3) hyperlink access to information on where the publications can be purchased or obtained from public and other libraries in the geographic vicinity of the user (in a very few instances where the IDA study team could not provide the reference via PDF files or links due to copyright issues).

The References Access CDs are attached to the inside cover of the paper copy of this document. If those CDs are missing, please contact IDA (as discussed below) for copies.

G. Readers' Feedback

IDA welcomes and encourages readers' feedback regarding this document, including comments, questions, and recommended corrections and refinements. Readers may contact IDA via either the U.S. Postal Service address or the e-mail address provided below.

Strategy, Forces, and Resources Division Attn: DRMS Project Leader Institute for Defense Analyses 4850 Mark Center Drive Alexandria, VA 22311 readingguide@ida.org

2. Results of the Collection Effort

A. Tier I References

The Tier I CD (CD #1) provides PDF files, or direct links to publications and websites, or information on where selected publications can be purchased or obtained.

I. Selected User-Friendly, Authoritative Reference Documents, Reflecting a Variety of Perspectives—International and U.S.

I-A. Determining Defense Capabilities and User Needs and Planning and Implementing Acquisition of Major Defense Systems

- A-1 Brown, Bradford. *Introduction to Defense Acquisition Management Guide*, 10th ed. Fort Belvoir, VA: Defense Acquisition University Press, 2010.
- A-2 Australian Government Department of Defence. *Defence Capability Development Manual*. Canberra: Department of Defence, Commonwealth of Australia, 2006.
- A-3 United Kingdom Ministry of Defense (UK MOD). *JSP 507 MOD Guide to Investment Appraisal and Evaluation*. London, UK: Department of Economic Statistics and Advice, 2006.
- A-4 UK MOD. "Defence Acquisition." *Policy Paper* No. 4. London, UK: Director General Corporate Communications, 2001.
- A-5 Sullivan, Raymond E., Jr. *Resource Allocation: The Formal Process*, 8th ed. Newport, RI: U.S. Naval War College, 2002.
- A-6 Cuda, Daniel L., Michael F. Fitzsimmons, John T. Hanley, Jr., James H. Kurtz, Lance M. Roark, and Vincent P. Roske, Jr. *Improving Integration of Department of Defense Processes for Capabilities Development Planning*, IDA Paper P-4154. Alexandria, VA: Institute for Defense Analyses, 2006.
- A-7 Defense Acquisition University. *Joint Program Management Handbook*, 3rd ed. Fort Belvoir, VA: Defense Acquisition University Press, 2004.
- A-8 Defense Acquisition University. Guidebook of Acquisition Policy and Discretionary Best Practices. Accessed May 12, 2011.
 https://dag.dau.mil/Pages/Default.aspx. The website contains eleven chapters addressing a wide range of acquisition topics plus other related information.
- A-9 In addition to full guidebook provided above, selected sections of guidebook that may be of special interest are highlighted below:
 - Chapter 1.3 (JCIDS)
 - Chapter 2.1.1.3 (Acquisition Program Baseline [APB]

- Chapter 2.1.1.4 (APB Content)
 Chapter 9.1.2 (JCIDS)
 Chapter 9.1.2.1 (Initial Capabilities Document)

I-B. Conducting Cost Assessments and Independent Cost Estimation

- B-1 Burke, Richard. "Realistic Cost Estimates for Acquisition: Cost Analysis Improvement Group (CAIG) Perspectives." Paper presented at the RTO SAS Symposium on "Cost Structure and Life Cycle Cost (LCC) for Military Systems," Paris, France, October 24-25, 2001.
- B-2 Azama, Stacey S. "Defense Systems Management College Teaching Note: Introduction to Cost Analysis." Course presented at the Defense Systems Management College, Fort Belvoir, VA, September 2000.
- B-3 Gene Fisher, Cost Considerations in Systems Analyses. Santa Monica, CA: RAND, 1970. Accessed May 12, 2011, http://www.rand.org/content/dam/rand/pubs/reports/2007/R490.pdf.
- B-4 Environmental Protection Agency (EPA). *Guide for Preparing Independent Government Cost Estimates*. Washington, DC: EPA, 2004.
- B-5 Office of the Secretary of Defense. Cost Analysis Improvement Group. *Operating and Support Cost – Estimating Guide.* Arlington, VA: Department of Defense, 2007.
- B-6 McNicol, David L. *Cost Growth in Major Weapon Procurement Programs*. IDA Paper P-3832. Alexandria, VA: Institute for Defense Analyses, 2004.
- B-7 Australian Government Department of Defence. *Defence Capability Development Manual*. Canberra: Department of Defence, Commonwealth of Australia, 2006, sections 7-1 and 7-2.
- B-8 Stewart, Rodney D. *Cost Estimating*, 2nd ed. New York: John Wiley & Sons, Inc., 1991.

I-C. Conducting Cost Estimation for Cost Reimbursable Contracts

No references directly addressing this topic were located. Since high
uncertainty is a key issue regarding cost reimbursable contracts, recommend
readers review documents listed in Section I.B. for discussions of "costing
under high uncertainty" that may be applicable to cost reimbursable contracts.

I-D. Contracting Approaches for Cost Reimbursable Contracts

- D-1 U.S. Army Corps of Engineers (USACE). *Guide to Best Practices for Cost Reimbursement Contracts*. Washington, DC: USACE, 1998.
- D-2 Nkuah, Moses Y. "Progress and Performance Control of a Cost Reimbursable Construction Contract," *Cost Estimating* 18, no. 5 (May 2006): 13–18.

B. Tier II References

The Tier II CD (CD #2) provides PDF files for publications listed below.

II. U.S. Legislation and DOD Directives and Instructions

II-A. Determining Defense Capabilities and User Needs and Planning and Implementing Acquisition of Major Defense Systems

- A-1 Department of Defense (DOD). DOD Directive (DODD) 5000.01, "The Defense Acquisition System," November 20, 2007.
- A-2 DOD. DOD Handbook DOD 5000.60-H, "Assessing Defense Industrial Capabilities," April 1996.
- A-3 DOD. DODD 7045.20, "Capability Portfolio Management," September 20, 2008.
- A-4 DOD. Department of Defense Instruction (DODI) 5000.02, "Operation of the Defense Acquisition System," December 8, 2008.
- A-5 DOD. DODI 5000.60, "Defense Industrial Capabilities Assessments," October 15, 2009.
- A-6 DOD. Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01G, "Joint Capabilities Integration and Development System," March 1, 2009.
- A-7 DOD. CJCSI 3100.01A, "Joint Strategic Planning System," September 12, 2003.
- A-8 DOD. CJCSI 3100.01B, "Joint Strategic Planning System," September 12, 2008.
- A-9 DOD. DODI 7041.3, "Economic Analysis for Decision-Making," November 7, 1995.
- A-10 DOD. DODI 8260.05, "Support for Strategic Analysis," July 7, 2011.

II-B. Conducting Independent Cost Estimation and Cost Assessments

- B-1 Weapon Systems Acquisition Reform Act of 2009, Public Law 111-23, May 22, 2009.
 - Cost Analysis and Program Evaluation organization
 - Independent Cost Estimation and Cost Analysis
- B-2 DOD. DOD Manual 5000.4-M, "Cost Analysis Guidance and Procedures," December 1992.
- B-3 DOD. DODD 5000.04, "Cost Analysis Improvement Group," August 16, 2006.
- B-4 DOD. DOD Manual 5000.4-M-1, "Cost and Software Data Reporting (CSDR) Manual," April 18, 2007.
- B-5 DOD. DOD Handbook 5000.60-H, "Assessing Defense Industrial Capabilities," April 1996.
- B-6 DOD. DODI 7041.3, "Economic Analysis for Decisionmaking," November 7, 1995.

II-C. Conducting Cost Estimation for Cost Reimbursable Contracts

• No references directly addressing this topic were located. Since high uncertainty is a key issue regarding cost reimbursable contracts, recommend readers review documents listed in Section II.B. for discussions of "costing under high uncertainty" that may be applicable to cost reimbursable contracts.

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1.	REPORT DATE (DD-MM-YY)	2. REPORT TYPE	3. DATES COVERED (From - To)
	August 2011	Final	
4.	TITLE AND SUBTITLE		5a. CONTRACT NO.
	References for Capability Assessment, Acquis	sition Planning, and Cost Estimation	DASW01-04-C-0003
			5b. GRANT NO.
			5c. PROGRAM ELEMENT NO(S).
6.	AUTHOR(S)		5d. PROJECT NO.
	Milton L. Tulkoff, Rachel D. Dubin	C6309	
			5f. WORK UNIT NO.
7.	PERFORMING ORGANIZATION NAME Institute for Defense Analyses 4850 Mark Center Drive Alexandria, VA 22311-1882	8. PERFORMING ORGANIZATION REPORT NO. IDA Document NS D-4400	
9.	. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR'S / MONITOR'S ACRONYM(S)
	Institute for Defense Analyses 4850 Mark Center Drive Alexandria, VA 22311-1882	11. SPONSOR'S / MONITOR'S REPORT NO(S).	
112	DISTRIBUTION / AVAIL ARILITY STATE	TEMENT	

13. SUPPLEMENTARY NOTES

Approved for public release; distribution unlimited.

14. ABSTRACT

This document addresses an Institute for Defense Analyses (IDA) study responding to a Japanese government request for references that would be of assistance to Japan in conducting defense capability assessments, acquisition planning, and cost estimation. Sources reviewed included books, journals, periodicals, articles, documents, and websites. In developing the list of references, IDA's objective was to be highly selective, i.e., to incorporate the most pertinent and useful U.S., and non-U.S. publications and sources. The primary criteria for selecting references included: extent to which reference effectively addressed some major portion of the topic of interest for this project; quality and clarity of the writing; and user-friendliness. IDA's search efforts identified thirty-five references that met the criteria established for the study. Of this total, 54 percent address capability planning, 40 percent address costing, and the remaining 6 percent address cost reimbursable contracts. To enable study users to gain quick access to the references, the document includes a set of "References Access" CDs containing PDF files or links to websites where the publications can be directly downloaded at no cost or information on where the publications can be purchased or obtained from public and other libraries in the geographic vicinity of the user.

15. SUBJECT TERMS

capability assessments, acquisition planning, cost estimation, independent cost estimation, cost reimbursable contracts

16. SECURITY CLASSIFICATION OF:		17. LIMITATION OF ABSTRACT	18. NO. OF PAGES	19a.NAME OF RESPONSIBLE PERSON Mr. Milton Tulkoff	
a. REPORT	b. ABSTRACT	c. THIS PAGE	UU		19b. TELEPHONE NUMBER (Include Area Code)
U	U	U			(703) 845-2378